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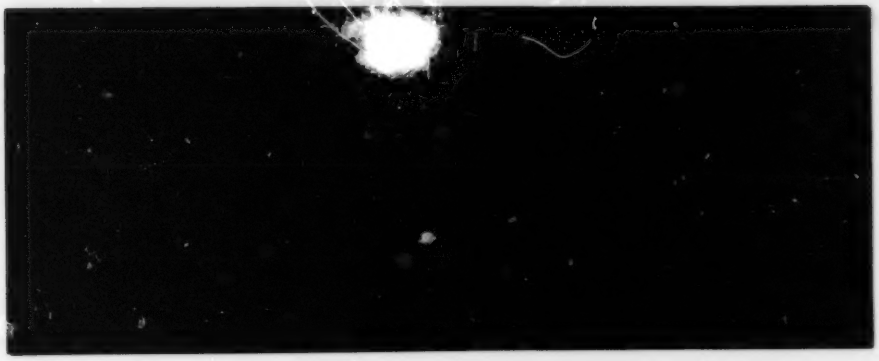

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Final Report

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Study and Screening of Biological Control Agents of Leafy Spurge

Conducted by
D. Schroeder

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C·A·B INTERNATIONAL INSTITUTE OF BIOLOGICAL CONTROL

EUROPEAN STATION

REPORT

Final Report

to

Department of Agriculture
Province of Saskatchewan, Canada
Agriculture Development Fund

Project No. R-86-05-0185

Study and screening of biological control agents of leafy spurge

by

D. Schroeder

March 1990

INTRODUCTION

The agreement signed on May 8, 1987 between the Department of Agriculture, Province of Saskatchewan, Canada and the Commonwealth Institute of Biological Control, European Station, to study and screen additional biological control agents for leafy spurge has been terminated.

During the period under report some seven additional potential insect biological control agents as well as pathogens associated with European leafy spurges were studied and screened.

In addition collections and shipments have been made of seven insect control agents previously studied and screened for field release in Saskatchewan and other Canadian Provinces.

Details of the work carried out in 1987 and 1988 have been reported previously (see Annual Reports by Gassmann and Prior). Therefore, this report will briefly summarize the total achievements and give information on the present status of the study and screening of additional biological control agents of leafy spurge.

In the meantime an application has been made for the continuation of research on leafy spurge control agents.

1.0 Work anticipated

1.1. Study and screening of Aphthona lacertosa

1.2. Study and screening of Oxicesta geographica

1.3. Investigation of Chamaesphecia spp. associated with European leafy spurges, select suitable species and start investigation of their experimental host range

1.4. A survey of the pathogens associated with European leafy spurges, especially Euphorbia virgata, with main emphasis on Uromyces spp., investigate and screen suitable species.

1.5. Collection and shipment of control agents for field release in Saskatchewan and other Canadian Provinces.

2.0. Work Programme Followed and Results

2.1. Study and screening of Aphthona lacertosa

The investigation of A. lacertosa commenced in 1987 and was terminated at the end of 1989.

It was found that A. lacertosa has a clear preference for E. virgata and its host range is limited to a few species in the subgenus Esula. In Europe, A. lacertosa has a continental distribution which is climatically analogue of areas in Canada infested by leafy spurge.

The adult beetles feed on the foliage of their hosts, whilst the larvae are feeding on the roots, causing significant damage at higher larval densities as an effect of which the above ground biomasss is significally reduced and flowering of attacked plants is suppressed.

The beetle has a good potential for controlling Canadian leafy spurge on Prairie sites too moist for A. nigriscutis (a species successfully established in Canada). There is no detrimental effect from the establishment of A. lacertosa and its release in Canada is recommended.

For detailed information see Final Report by A. Gassmann forwarded in January 1990.

2.2. Study and screening of Oxicesta geographica

Originally it had been planned to investigate the moth Malacosoma castrense which was reported to attack leafy spurges in the steppic areas in the southwestern USSR. A collection of larvae was received from the USSR in 1987, but the adults which developed belonged to another species, Oxicesta geographica. Since colonies of this species were also found in Hungary in 1988, it was decided to study and screen O. geographica instead of M. castrense.

The life history, mode of attack and effect on the attacked plants, as well as the host range of O. geographica were investigated in detail during 1988 and 1989. It was found that O. geographica is restricted to the genus Euphorbia and has a clear preference for the subgenus Esula. Host specificity screening revealed, however, that O. geographica appears to have a relatively large oligophagy and, considering larval host preference, is a rather unpredictable species. It had, therefore, to be decided not to propose the release of this moth in Canada or elsewhere in North America.

For details see the Final Report by A. Gassmann forwarded in December 1989.

2.3. Investigation of Chamaesphecia spp.

The investigation of the Chamaesphecia spp. associated with various leafy spurges species in Europe commenced in 1987 and had considerably advanced by the end of 1989. Surveys were carried out in Hungary, Czechoslovakia and Yugoslavia and some five species of potential interest were found. One species, C. crassicornis, attacking E. virgata in Hungary, Czechoslovakia and Romania was studied and screened by the USDA Biocontrol of Weeds Laboratory at Rome, Italy. Therefore, our studies concentrated on another three species, i.e. C. bibioniformis, C. hungarica and C. palustris.

Host acceptance tests with Canadian leafy spurge in 1988 revealed that C. hungarica is the best suited species, and thus host range screening commenced and was almost completed during 1989. It was found that C. hungarica is restricted to a very small number of species within the Euphorbia subgenus Esula, and is therefore a promising biocontrol agent for leafy spurge in Canada. It is expected that host specificity screening can be completed in 1990, and field release of C. hungarica can commence in 1991.

In contrast, host acceptance tests with C. palustris in 1988 and 1989 confirmed that this species is unable to develop on Canadian leafy spurge.

The third species studied (C. bibioniformis) can survive and develop normally on Canadian leafy spurge under drought stress, as experiments carried out in 1989 have shown. It will be tried to select for a genotype of C. bibioniformis with evolved adaptations to leafy spurge in dry habitats. This would allow its establishment on leafy spurge in larger areas of its North American distribution.

In 1989, another species of Chamaesphecia, C. euceraeformis, was obtained for the first time. Host acceptance tests with Canadian leafy spurge are planned for the 1990 field season.

For further details see report by D. Schroeder on Weed Projects for Canada and the northern United States forwarded in February 1990.

2.4. Pathogens associated with European leafy spurges

In addition to infected spurge material obtained from the USSR, a first field survey for infested plants was carried out in Rumania in 1988. Additional field surveys were made in Austria, Hungary and Czechoslovakia in conjunction with spurge insect collections in 1989. Additional samples of infested plants were obtained from Yugoslavia (I. Tosevski), Greece (A. Sobhian) and Switzerland (A. Gassmann).

Identification of Uromyces spp. teliospores by scanning microscopy (SEM) was completed for rusts of at least two plants from each collection in Austria, Czechoslovakia and Hungary. All specimens from E. virgata were U. scutellatus. This species was also collected from E. esula, E. seguieriana, E. cyparissias and E. lucida.

Unfortunately, no host acceptance tests could be made with Canadian leafy spurge, because the teliospores collected did not germinate, although all known techniques for the induction of spore germination have been tried. It is therefore planned to follow spore germination, penetration and disease development under field conditions in Hungary during the 1990 field season.

For details see Progress Report by A.N.G. Holden and C. Prior forwarded in December 1989.

2.5. Collections and shipments of spurge control agents for field release in Canada

According to the requests of Dr. P. Harris, material of some seven control agents of leafy spurge were sent to Regina, Saskatchewan, for field release (see Table 1).

2.5. Discussion

In summary it can be stated that the work planned for the period under report has been largely carried out as planned. As a result, one new control agent, Aphthona lacertosa, can be released in 1991 if permission will be obtained in time from the Review Group. The screening of a second agent species, Oxicesta geographica, has also been completed as planned, but because of its oligophagy its release in Canada cannot be proposed. A third species, Chamaesphecia hungarica, has been identified as a suitable control agent of leafy spurge and shall be ready for field release in 1991.

The investigations on another two species of Chamaesphecia progressed well and will continue in 1990.

Although, a relative large number of pathogen collections has been made, especially during 1988 and 1989, and the identification of the pathogens has been made, it has not been possible to conduct infection tests with Uromyces scutellatus, because germination of teliospores could not be induced. This was a frustrating experience which we share with pathologists of the USDA-ARS Foreign Disease-Weed Science Laboratory at Fort Detrick, Maryland, who collected Uromyces spp. from Rumania and the USSR. It is hoped that field observations in Hungary in the spring of 1990 will help to solve this problem.

All requests of Dr. Peter Harris for shipments of spurge biocontrol agents for field release in Canada have been fulfilled.

ADDITIONAL
REPORTS ON WORK DONE IN
Europe and NORTH America
available Through DR. PETER HARRIS,
Research Station, Agriculture
CANADA, Regina, Sask.